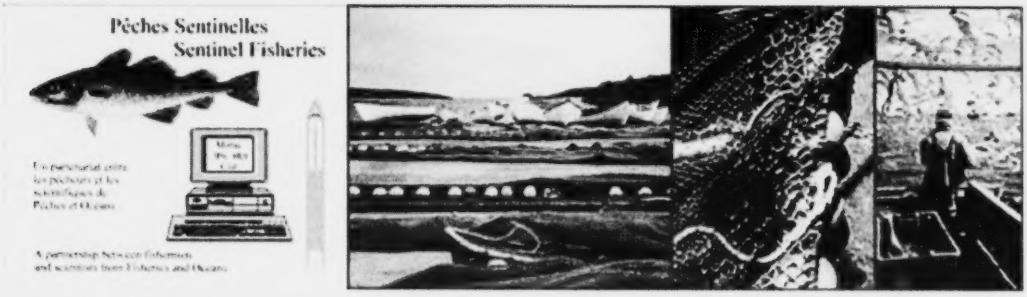

Preliminary Report on the July 2007 Mobile Sentinel Survey in the Northern Gulf of St. Lawrence

December 2007

Sentinel Fisheries Program

Each year, biologists from Fisheries and Oceans assess the status of commercially exploited fish and invertebrate stocks. In order to perform these evaluations, scientists use data provided, in part, by mobile gear sentinel fishers (trawlers). The surveys performed by the mobile sentinel fishers cover almost the entire northern Gulf of St. Lawrence. Once analysed, the collected data are used to calculate abundance indices that are used to estimate the status of various stocks.

The mobile gear Sentinel Fisheries Program follows a depth-stratified random survey plan. The northern Gulf is divided into depth strata because depth is known to have an influence on the distribution of fish and invertebrate species. The following strata have been defined: 10-20, 20-50, 50-100, 100-150, 150-200 and over 200 fathoms (1 fathom = 1.83 meters = 6 feet). The mobile survey generally consists of 300 stations randomly selected within those strata. All strata are sampled because results from this survey are used for many species that have different depth preferences. It is also important to find the limits of distribution of a specie and to monitor any potential shifts in time . Nine trawlers, five from Newfoundland and four from Quebec perform the entire survey. At each predetermined station, the vessel performs a standard 30 minutes tow at 2,5 knots. The nine boats participating in the survey use the same trawl, a 300 Star Balloon mounted on a Rock Hopper footgear. The trawl mesh size is 145 mm with a liner of 40 mm in the codend. The use of a liner allows the sampling of fish as young as age 2 for cod but also requires the presence of an observer or a trained technician aboard each vessel. The observers are from Biorex in Quebec and Seawatch in Newfoundland. In spite of the fact that all nine boats use the same trawl, a study showed a 25% variability in wing spread opening during trawling activities. The use of a restrictor cable allows to reduce this variability from 25% to 6 % without bias due to depth and thus to compare the catches from all vessels.

The sentinel surveys require a great deal of thoroughness in collecting a variety of data. With the help of crewmembers, observers or technicians are responsible for the collection of numerous data according to a scientific protocol. At each set, the total catch is sorted by species and weighed. Then the length, weight, sex, and maturity of a number of fish of each species are recorded. For specific demands, some samples (otoliths, liver, gonads, stomach etc.) may also be taken on some fish. Moreover, fish samples are collected and frozen for diverse studies. Finally, water temperature and fishing depth data are collected using a Vemco sensor installed on the trawl. These biological and oceanographic data yield valuable information on the size, growth, condition and diet of various species, as well as stock abundance and water temperature.

The Department of Fisheries and Oceans (DFO) has primary responsibility for the administration of the sentinel program. The implementation of the program is the responsibility of the Association des Capitaines-Propriétaires de la Gaspésie inc. (ACPG) for mobile gear fisheries in Divisions 4S and 4T, and of the Fish, Food and Allied Workers (FFAW) of Newfoundland in Subdivision 3Pn and Division 4R.

Between 1995 and 2002, two mobile surveys were carried out annually. These fishing activities, each lasting about two weeks, were conducted in July and October. Since 2003, only the July survey is done every year due to rationalisation and cuts of 34% in the sentinel program budget,.

July 2007 Survey

The 13th annual July sentinel survey was conducted in the northern Gulf of St. Lawrence between June 30 and July 13, 2007. A total of 291 fishing stations were successfully carried out (Figure 1), i.e. 21 in 3Pn, 129 in 4R (including 10 tows in the 10 to 20 fathoms strata), 111 in 4S and 30 in 4T. Those 291 stations represent 96% of the sampling target.

- From July 1 to July 17, four Quebec trawlers sampling 4ST completed 141 out of a planned 152 stations (Figure 1). On the west coast of Newfoundland (3Pn, 4R), from June 30 to July 4, five trawlers carried out all 150 planned stations (Figure 1).

- The 30 tows in the 4T Division are conducted to complement the assessment of the Unit 1 redfish and the Greenland halibut (turbot) stocks for the management unit 4RST. **The cod catches in 4T are not used to estimate the abundance of the northern Gulf of St-Lawrence cod stock (3Pn, 4RS)** .

- Catches from the 10 tows carried out in the three coastal strata in 4R (10 - 20 fathoms) were used to calculate an index of minimum trawlable biomass for cod. However, the treatment of this new index (2003 to 2007) will be re-evaluated in the upcoming cod assessment in February 2008. In the last cod assessment of 2007, this index was examined and it was decided to pursue the sampling of the inshore strata and to revisit the data at the next cod assessment.

- Cod, redfish, turbot and Atlantic halibut catches for the 291 successful tows of the 2007 July survey are presented in table 1. This table also shows the total catches including the unsuccessful and the discretionary tows. It is important to note that following the Larocque case, there were no discretionary tows allowed this year. In 2007, the fish composing the main proportion of the other species category are herring, American plaice, thorny skate and white hake .

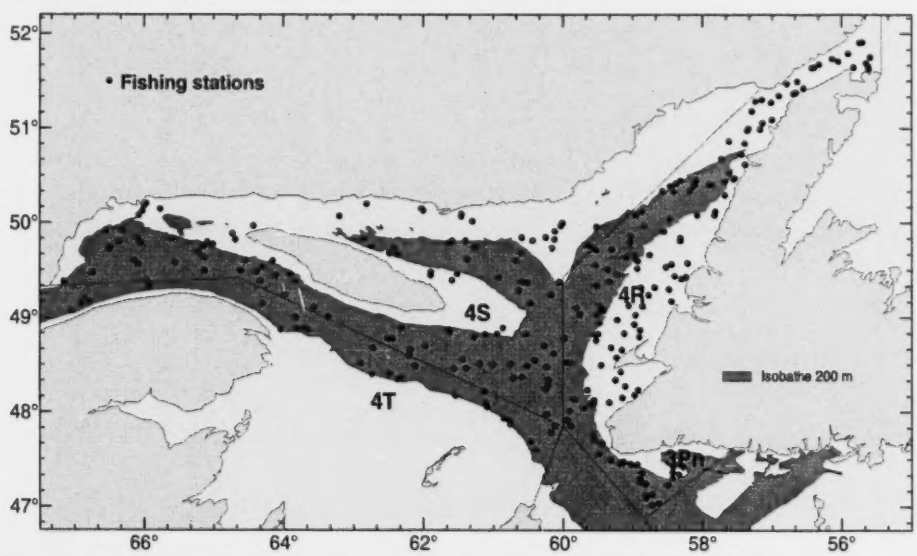

Figure 1: Distribution of stratified random tows performed during the July 2007 survey.

Table 1: Cod, redfish, turbot and Atlantic halibut catches for the successful tows and total catches including unsuccessful and discretionary tows for the July 1995-2007 surveys (3Pn, 4RST).

	Sets	Survey Catches (kg)				Sets	Total Catches (kg)				
Year	Survey	Cod	Redfish	Turbot	Halibut	Total	Cod	Redfish	Turbot	Halibut	Other Species
1995	311	6 477	11 457	649	84	326	6 598	11 662	675	84	4 716
1996	272	7 254	16 921	1 300	114	332	12 108	27 169	1 502	150	8 593
1997	285	8 642	12 358	1 206	27	313	11 271	13 582	1 397	80	5 848
1998	289	7 719	16 154	1 472	17	320	12 196	36 231	1 668	113	7 198
1999	294	5 487	12 623	1 703	42	335	19 396	17 177	2 079	129	4 031
2000	291	7 893	7 574	1 583	97	324	16 963	10 486	1 932	126	5 454
2001	275	10 238	7 603	1 342	120	317	16 476	14 421	1 814	208	4 194
2002	261	7 729	8 101	1 486	113	293	18 551	8 849	3 090	160	4 155
2003	296	13 741	6 400	1 693	44	326	14 040	6 616	3 512	72	3 590
2004	280	14 072	8 245	2 015	216	317	15 655	13 295	2 567	271	6 670
2005	285	9 662	6 785	2 977	226	303	10 023	7 802	3 649	402	8 652
2006	295	13 174	5 106	2 748	335	325	15 332	5 963	3 624	577	6 647
2007*	291	6 431	6 797	2 976	382	297	6 435	6 836	2 977	399	3 905

* No discretionary tows

1. ***Biomass and Distribution of Groundfish***

Cod

The July sentinel survey series (1995-2007) suggests an increase in the minimum trawlable biomass index for cod between 1995 and 2000 with a rather stable period up to 2006. Data for 2007 indicate a marked decrease in the biomass index which is comparable to the level observed in 1999 (Figure 2a). The biomass estimate for 2007 in Subdivision 3Pn and Divisions 4RS (more than 20 fathoms) is 42 856 tons.

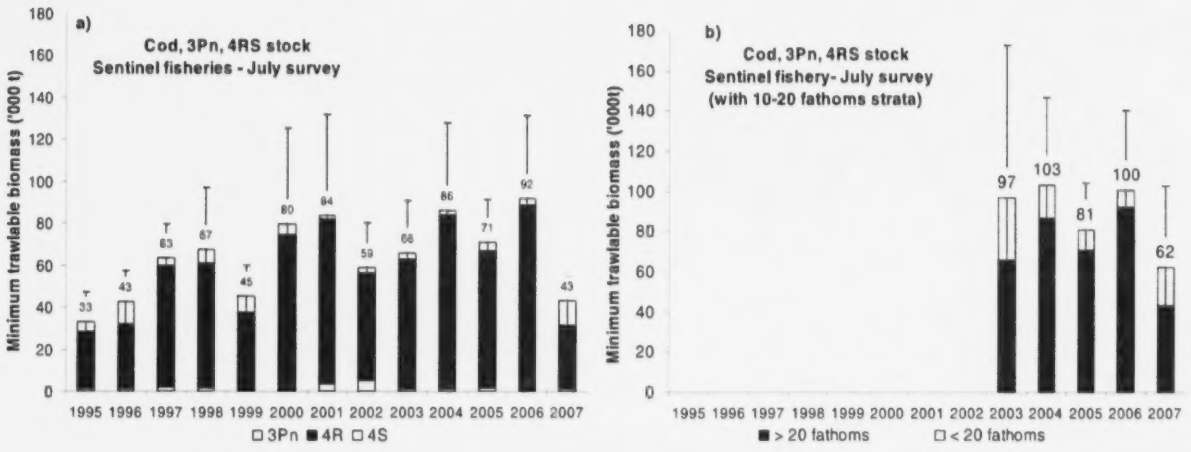

Figure 2: Minimum trawlable biomass index for cod based on the stratified random tows of the July sentinel mobile survey in Subdivision 3Pn and Divisions 4RS (1995 – 2007). a) For strata of depth greater or equal to 20 fathoms b) Including the three strata in 10-20 fathoms.

The major change in the 2007 biomass estimate per Division is an increase of 318% in 4S increasing from 2 741 t in 2006 to 11 468 t in 2007. This biomass estimate for 4S is the highest of the time series. This high value is mainly due to good catches around Anticosti and close to Sept-Iles. The biomass estimate for 4R Division shows a decrease of 66% from 88 218 t in 2006 to 30 373 t in 2007. This is the second lowest value for 4R since 1995.

Since 2003, three inshore strata between 10 and 20 fathoms are sampled in the 4R Division. The purpose of adding those strata was to look for the presence of cod outside the zone previously sampled by trawlers in the July mobile gear sentinel survey. The location of the strata are as follows: one on both side of the strait of Belle Isle; one north of the 49th parallel; and another south of the 49th parallel. Ten tows were done in these strata by four trawlers during the July 2007 survey (Figure 3). The cod catches varied between 2 and 1 150 kg for a 30-minutes standard tow. Seven of the ten tows reached the 30 minutes duration while the other three lasted less than 30 minutes, either because of bad bottom (trawl hooked at the bottom) or because of the presence of fixed gears. This year, the minimum trawlable biomass for those three strata is the second highest of the short series with 19 028 t (Figure 2b). The estimate of total minimum trawlable biomass including the 10 to 20 fathoms strata is nevertheless the lowest of the 2003-2007 series with 61 884 t.

As in the past, the catch distribution shows that cod is located primarily in 4R Division along the west coast of Newfoundland (Figure 3). The cod concentration remains low in 4S Division and 3Pn Subdivision. Of the 291 tows performed in this survey, 4 had catches of cod of more than 300 kg. Of those 4, 3 were located in 4R and one in 4S. This 4S catch of 303 kg is the most important for this zone in the 13 year time series of the mobile sentinel survey.

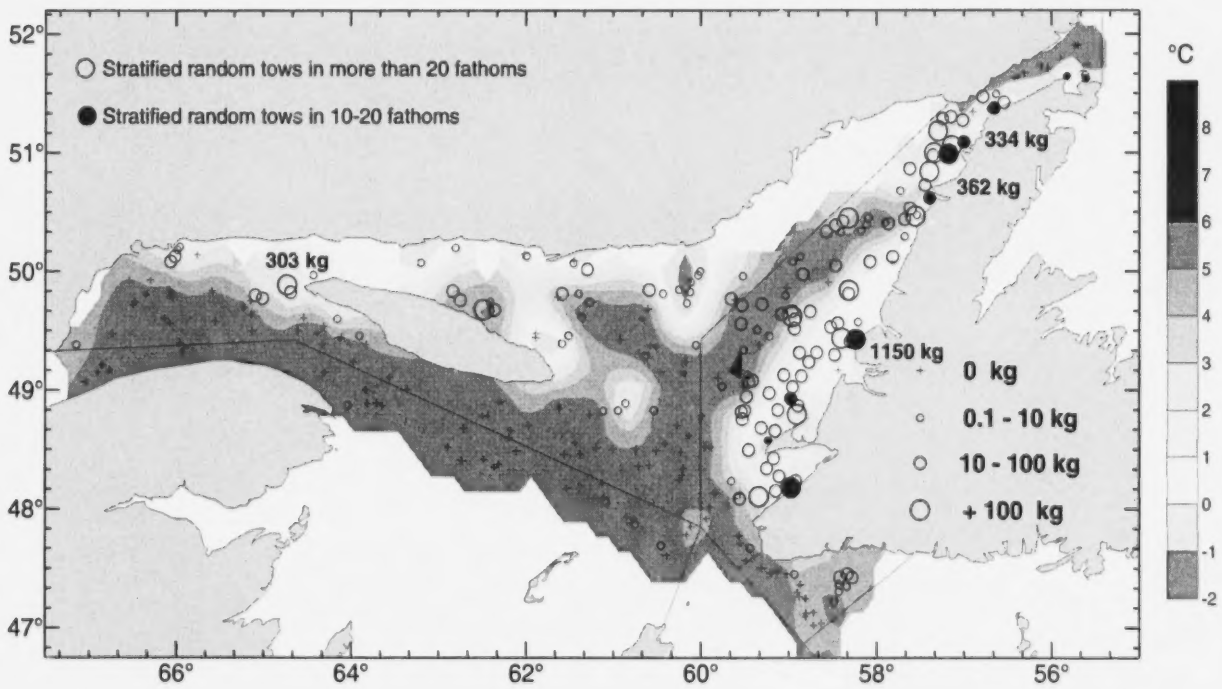

Figure 3: Bottom temperature and observed catch rate (kg / standard tow) distribution of cod for the July 2007 stratified random survey in 3Pn Subdivision and 4RST Divisions. Catches greater then 300 kg are identified on the map.

Redfish

For Unit 1 redfish stock (4RST Divisions), the July sentinel survey series (1995-2007) indicates a higher minimum biomass estimate between 1996 and 1999. In 2000, there is a decrease in the minimum trawlable biomass index which is relatively stable up to 2007 (figure 4).

As in earlier years, the redfish was concentrated for the most part in the channels of the Northern region of the Gulf (Figure 5). In July, good concentrations of redfish were found in the 3Pn Subdivision. This area is not part of the redfish stock of Unit 1 management (4RST) between the months of June to December.

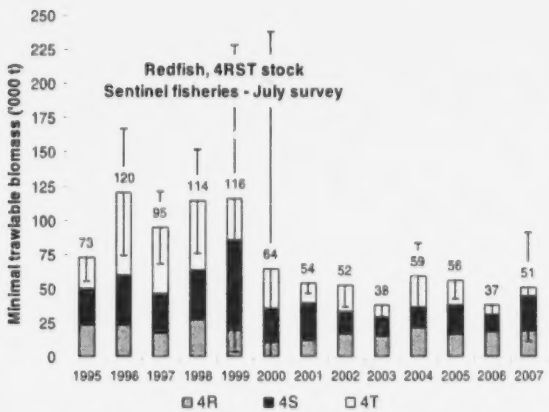

Figure 4: Minimum trawlable biomass index for redfish in 4RST based on the July stratified random survey (1995 – 2007).

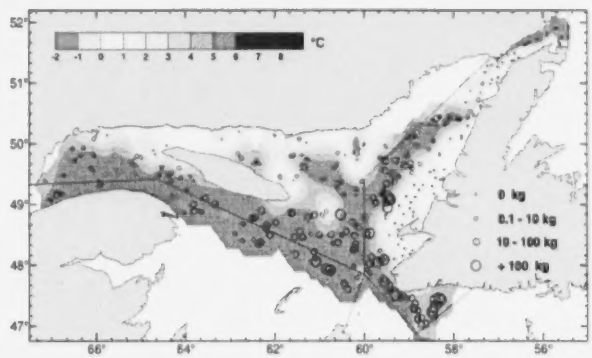

Figure 5: Bottom temperature and catch rate (kg / standard tow) distribution of redfish for the July 2007 stratified random survey in 3Pn and 4RST.

Turbot (Greenland Halibut)

For the Gulf of St. Lawrence turbot stock (4RST Divisions), the July sentinel survey series (1995 – 2007) shows a general increase in biomass from 1995 to 2005 with a relative stability up to 2007. The total biomass estimate for 2007 is the highest of the series with 39 547 t.

Turbot was concentrated mostly in the Estuary and in the Laurentian Channel, around Anticosti Island and in the Northern portion of the Esquiman Channel (Figure 7). The distribution of Greenland halibut is overall similar to those of earlier years. The mobile sentinel survey does not sample the Estuary where turbot is found in abundance in the August DFO's annual scientific survey and in the commercial fishery.

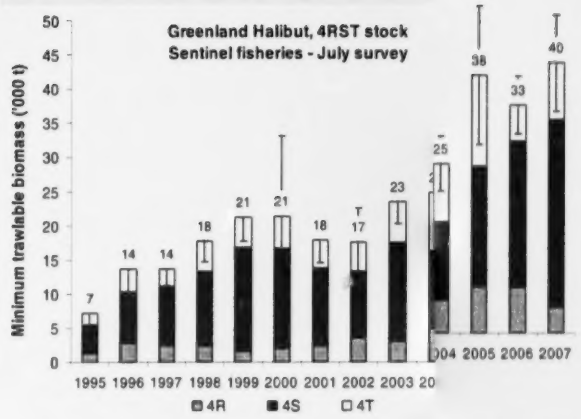
Greenland Halibut, 4RST stock
Sentinel fisheries - July survey
Minimum trawlable biomass ('000 t)
1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
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Figure 6: Minimum trawlable biomason the July Greenland halibut based 995–2007). stratified random survey (19

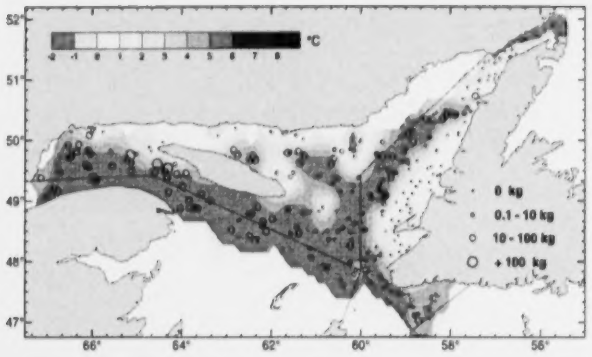

Figure 7: Bottom temperature and catch rate (kg/standard tow) distribution of Greenland halibut for the July 2007 stratified random survey in area 3Pn, 4RST.

Atlantic Halibut

ntic halibut bas ed on the sentinel survey shows a low and stable
The minimum trawlable index for Atlara gradual increase up to 2007 (Figure 8). The biomass estimate for
biomass between 1995 and 2003 with ath 4 397 t.
2007 is the highest of the time series wi

alibut shows its presence in the Esquiman, Laurentian and Anticosti

The catch distribution map of Atlantic h
channels (Figure 9).

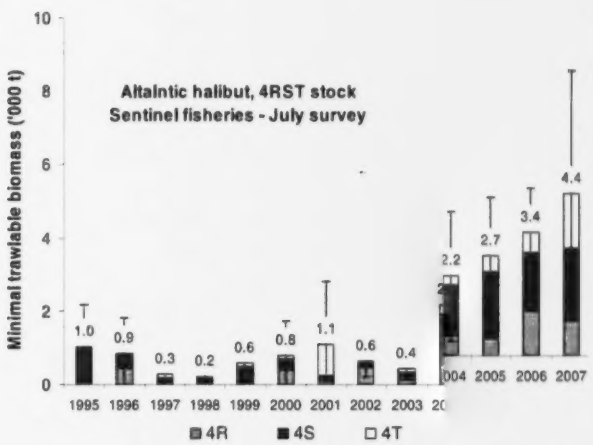
Altalntic halibut, 4RST stock
Sentinel fisheries - July survey
Minimal trawlable biomass ('000 t)
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Figure 8: Minimum trawlable biomass the July Atlantic halibut based on 95–2007). stratified random survey (19

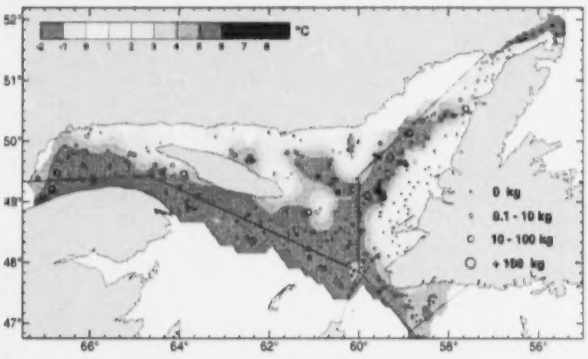

Figure 9: Bottom temperature and catch rate (kg/standard tow) distribution of Atlantic halibut for the July 2007 stratified random survey in area 3Pn, 4RST.

2. Sampling and Analysis

The catches were sorted by species, weighted and/or counted .The sampling of biological data (length, sex and weight) was completed for cod, redfish, Greenland halibut, Atlantic halibut and witch flounder.

Otoliths

Otoliths were taken from cod in area 3Pn, 4RS. The otoliths are used to determine the age of individual specimens and these data will be included in the next cod stock assessment to be held in winter of 2008. Age is one of the key parameter in the study of fish population dynamics and in the evaluation of the abundance for the northern cod of St. Lawrence (3Pn, 4RS). The abundance is actually assessed with a model that has age-structured data as inputs. Such models allow a better monitoring of the evolution of the stock dynamic. These models are named Sequential Population Analysis models (SPA).

Stomachs

Cod and Atlantic halibut stomachs were collected to study the fish diet. Frozen samples were sent to the Maurice Lamontagne Institute where Denis Chabot's group will analyse the stomach contents.

Witch Flounder

In addition to the total weight per set, length frequencies per sex were collected for the witch flounder's assessment. Douglas Swain of the Gulf Fisheries Center in Moncton (DFO) is the scientist responsible for the stock assessment of that specie.

Acknowledgements

We wish to acknowledge the dedicated work of all the skippers, crewmembers, observers, technicians, and coordinators who contributed in reaching the objectives of the 13 th annual July sentinel survey.

Table 2. List of the skippers (*boat name*), crewmembers, technicians, and observers (company) who contributed to the July 2007 sentinel survey:

4R, 3Pn			4S		
Skipper	Crew	Observer	Skipper	Crew	Observer
Winsor Hedderson (*Northern Tip*)	Derrick Pittman Anthony Pilgram Jason Saunders	Jason Spingle (FFAW)	Jean-Pierre Élément (*Rémy Martin*)	Rémy Élément Martin Élément	Steve Chouinard (Biorex)
Garfield Warren (*885-77*)	Leonard Warren Enos Gaulton Ephrim Smith	Monty Way (FFAW)	Clément Samuel (*Scène*)	Normand Samuel Johnny Dumaresq	Diane Darveau (Biorex)
Dereck Coles (*Catalina Venture*)	Robert Coles Gorvin Williams Ashley Coles Abe Coles	James Loughlin / James Poole (FFAW / Seawatch)	Marcel Roy (*Sextan*)	Gildas Cotton Jean-Guy Côté Mathieu Roy	Patrick Savard (Biorex)
Murray Lavers (*Sylvia Lynn II*)	Floyd Biggin Warren House Barry Ryan George Plowman	Loomis Way (FFAW)	Réjean Bernatchez (*Chlorydon*)	Paul-René Côté Gilles Côté	Marcel Boucher (Biorex)
Dan Genge Jr. (*NFLD Storm*)	Claude Genge Jr. Kevin Genge Genna Genge Whyman White	Levi Harvey (Seawatch)			

For more information:

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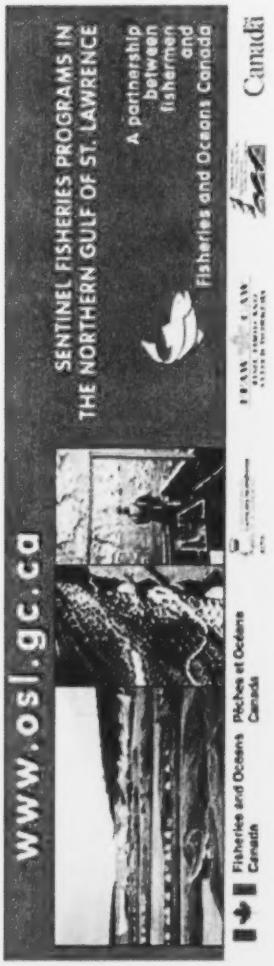
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